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Cecil, Jr. et al.

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[54] **PANEL MOUNTED CONNECTOR ASSEMBLY**

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[73] Assignee: **Molex Incorporated**, Lisle, Ill.

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[51] **Int. Cl.**[7] **H01R 13/64**

[52] **U.S. Cl.** **439/247**; 439/248

[58] **Field of Search** 439/247, 248, 439/545, 555, 556, 557, 547

[56] **References Cited**

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Primary Examiner—Paula Bradley
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Attorney, Agent, or Firm—Stacey E. Caldwell

[57] **ABSTRACT**

A connector assembly is disclosed for mounting through an aperture in a panel. The assembly includes an adapter mountable in the aperture. A first connector is mountable to the adapter and has limited axial floating movement relative thereto. A second connector is mateable with the first connector with a given mating force. A latch-release mechanism is provided between the first connector and the adapter to latch the first connector against the floating movement and to allow the second connector to be mated with the first connector with the given mating force. The latch-release mechanism is released in response to a force greater than the given mating force to allow the limited floating movement and numerous mating cycles.

13 Claims, 4 Drawing Sheets

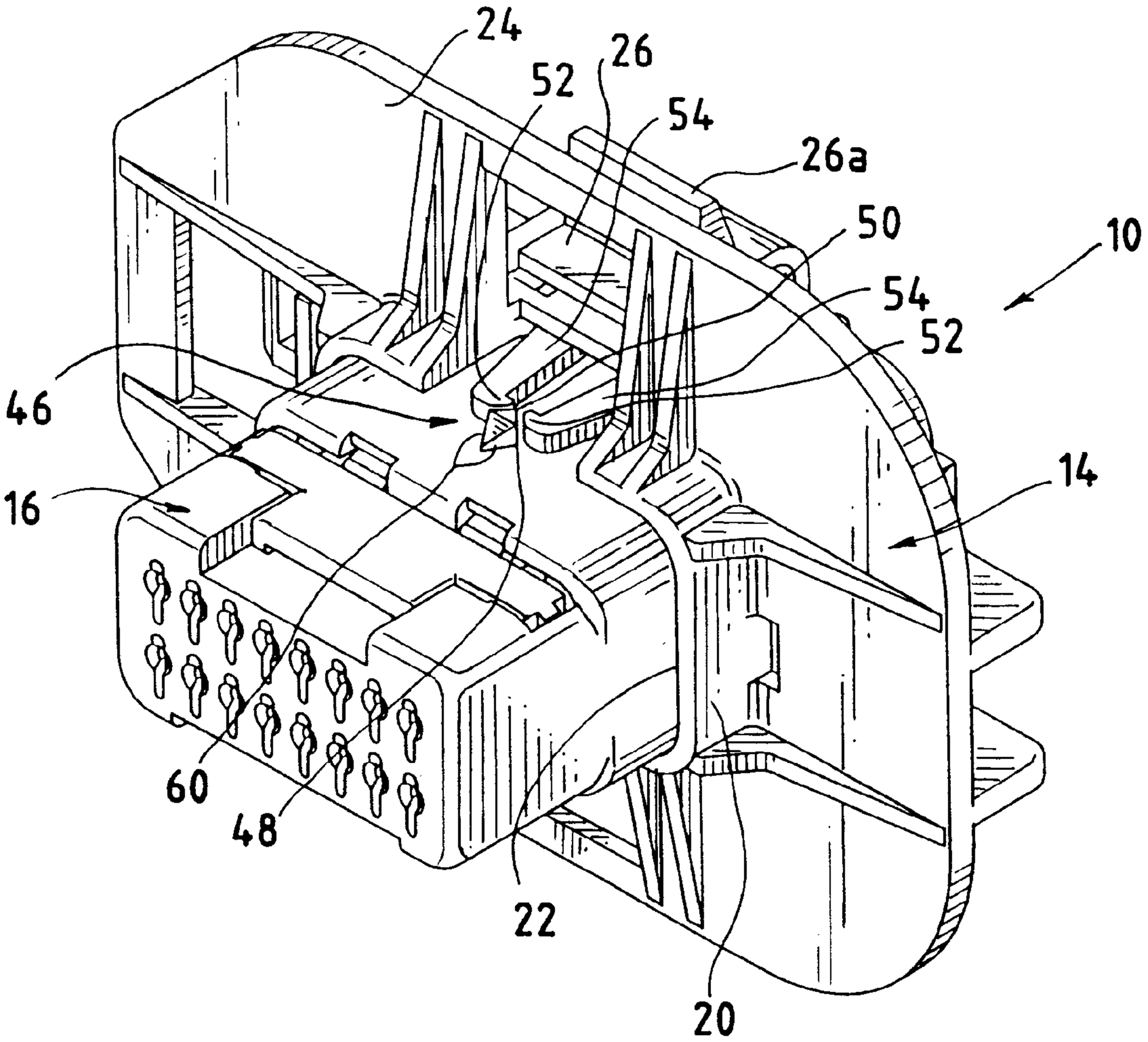


FIG. 1

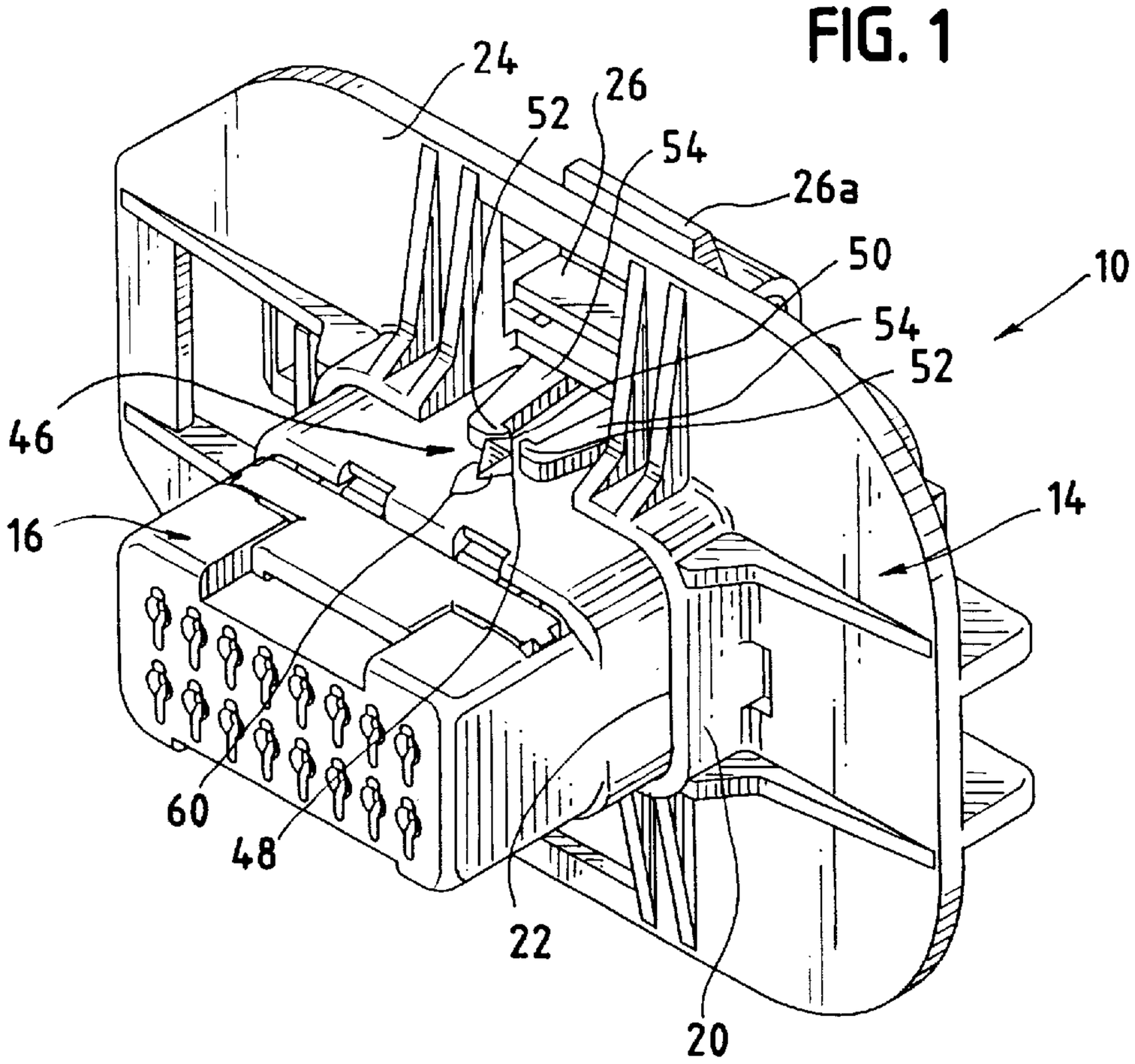

24
52
26
54
26a
50
10
54
52
46
14
16
60
48
22
20

FIG. 2

14
10
Y
26a
26
26
X
26a
16
22
20
16
30
B
26
24
28
26a

FIG. 3

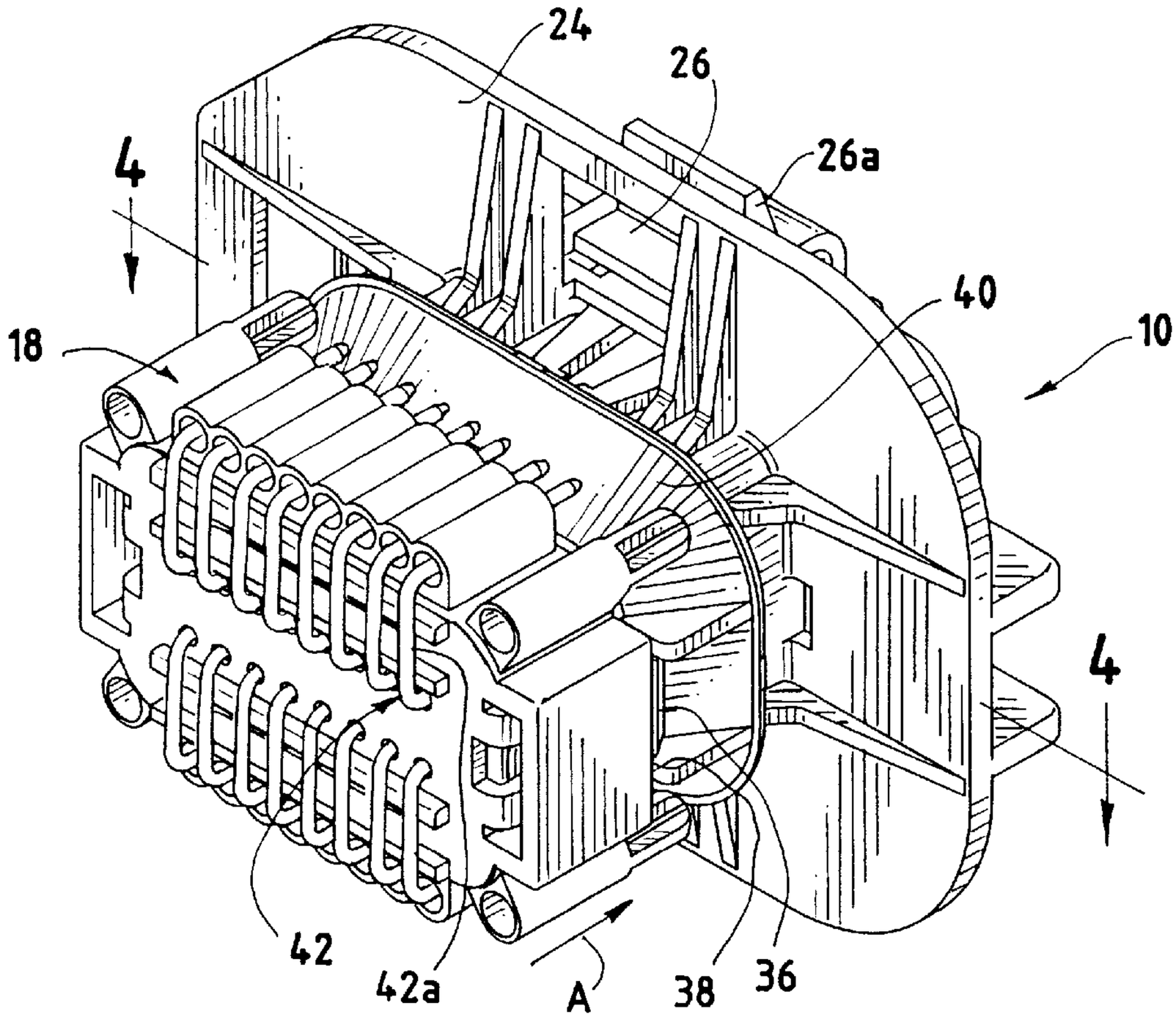

24
26
26a
4
18
40
10
4
42
42a
A
38
36

FIG. 4

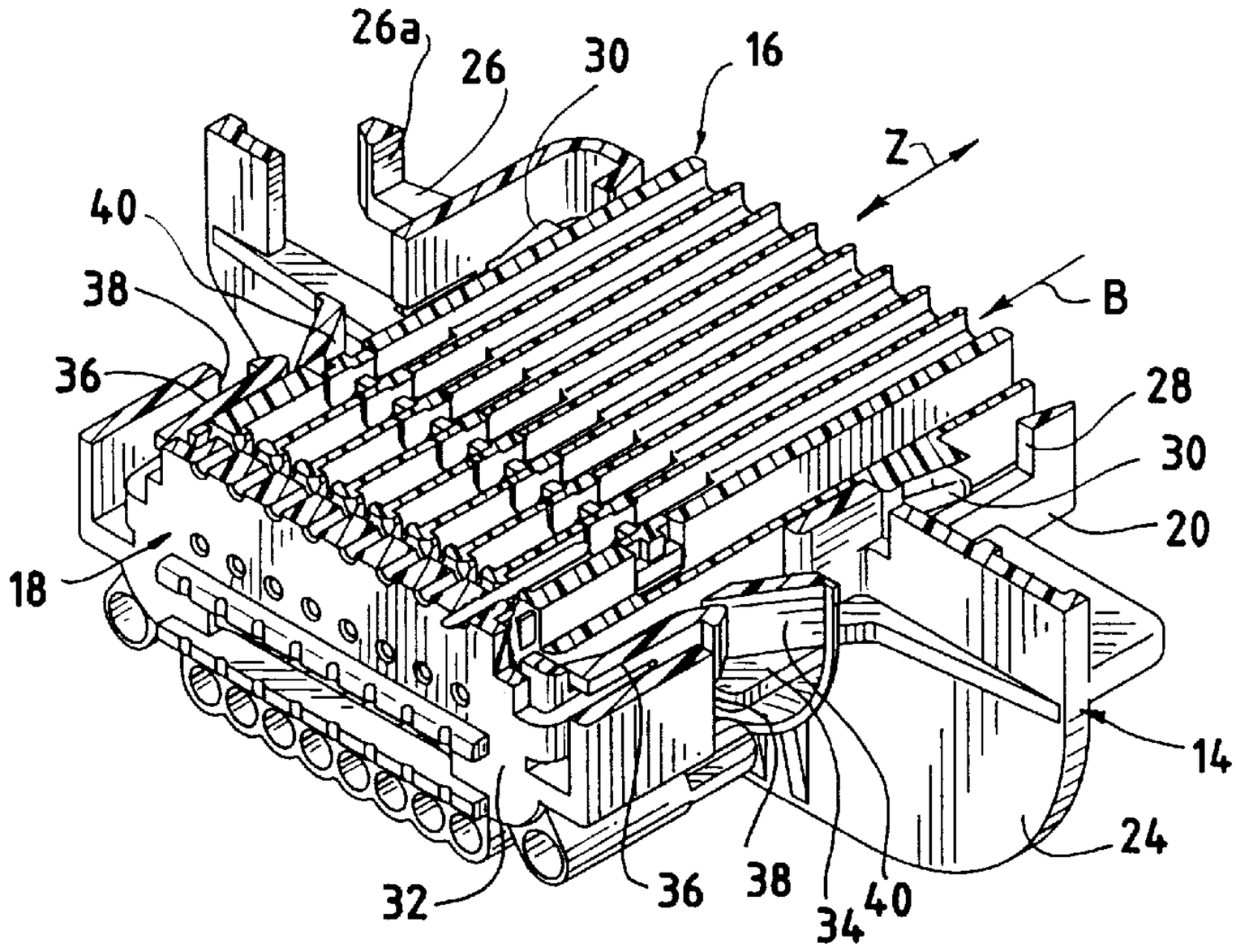

26a
26
30
16
Z
40
38
B
36
28
30
20
18
14
24
32
36
38
34
40

FIG. 5

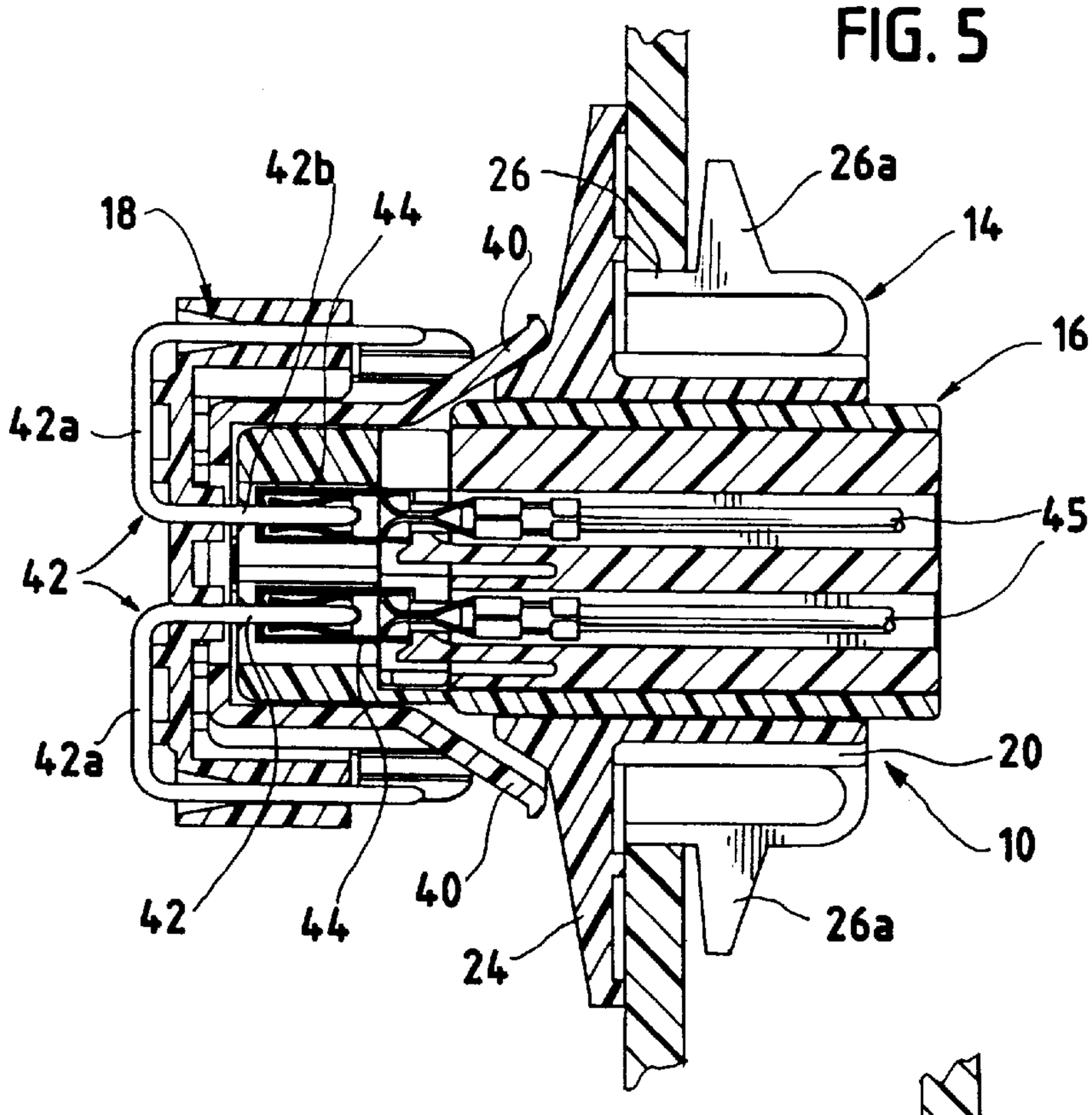
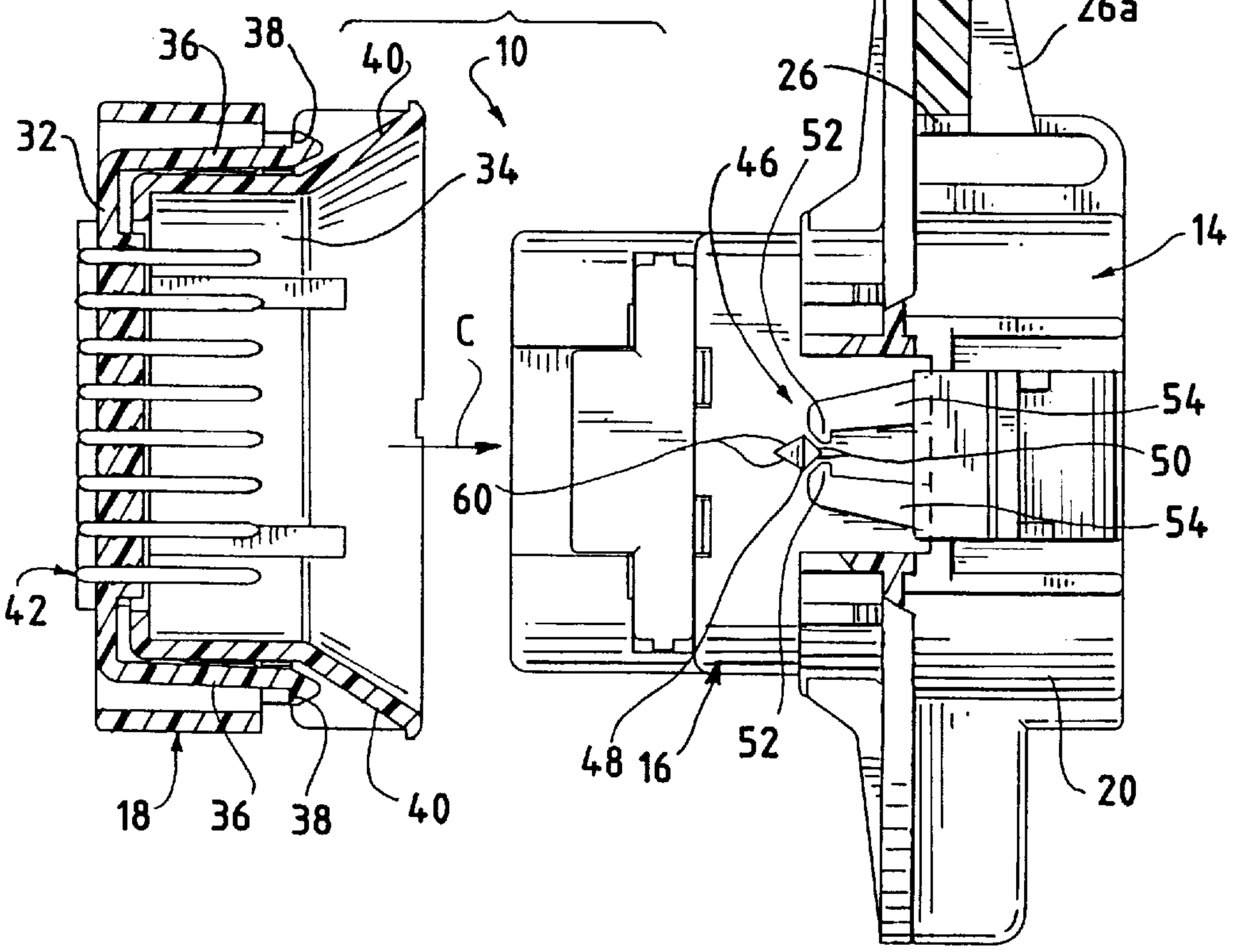
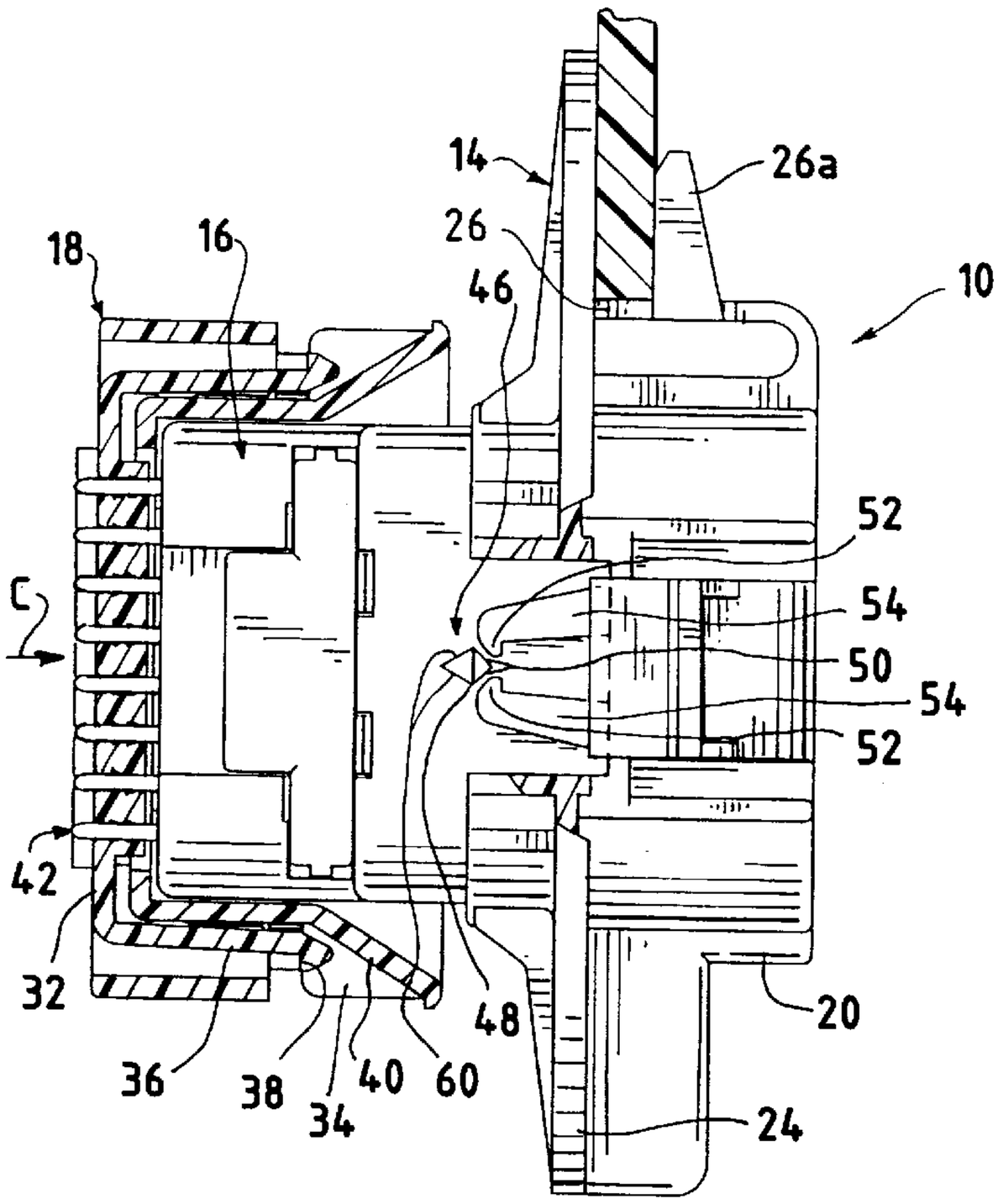

18
42b
44
26
40
26a
14
16
42a
42
45
42a
20
10
42
44
40
24
26a

FIG. 6A


36
38
40
10
32
34
C
60
42
18
36
38
40
24
26a
26
52
46
14
54
50
54
48
16
52
20


14
26a
26
46
10
18
16
52
C
54
50
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52
42
32
48
20
36
38
40
60
34
24

FIG. 6B

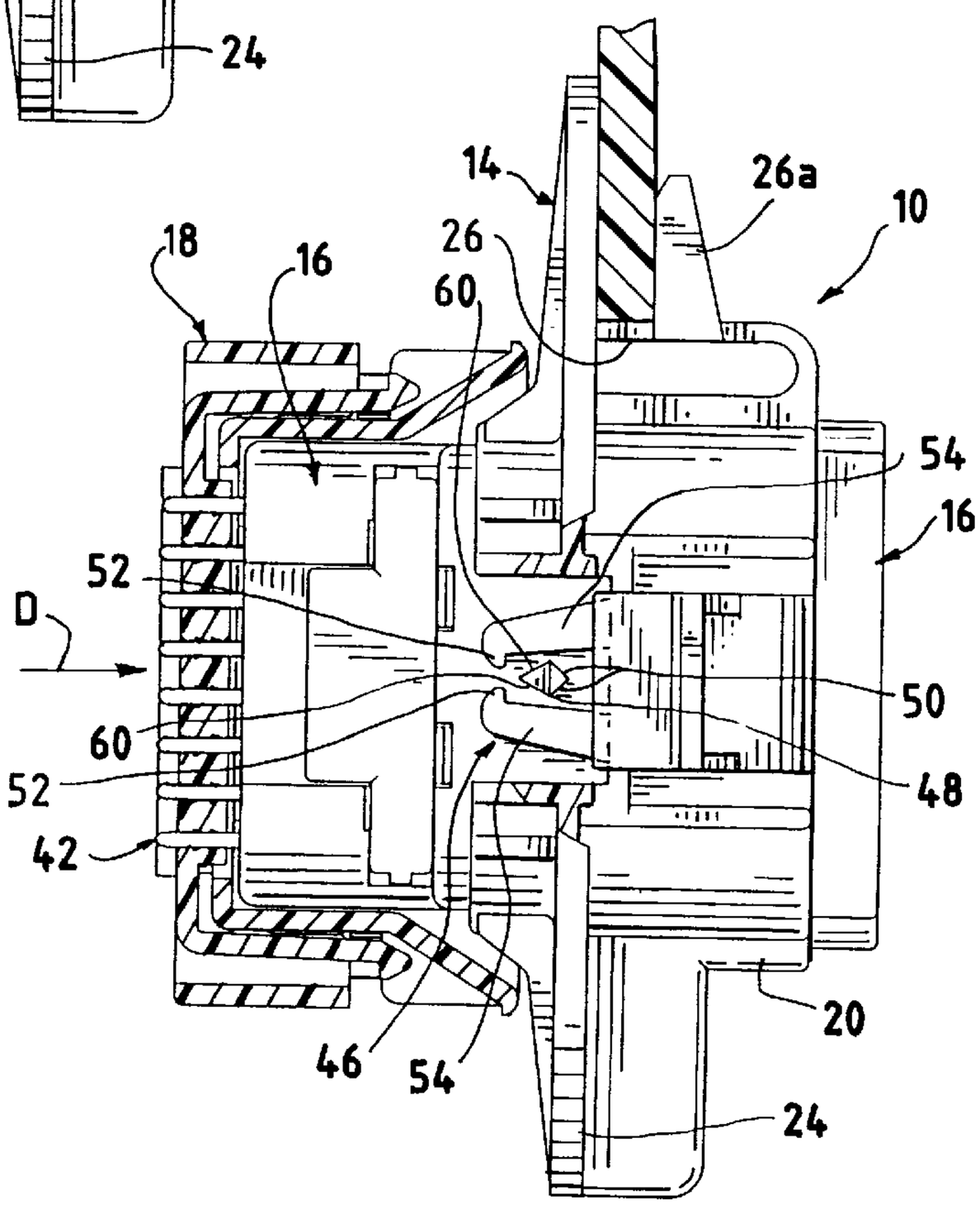
14
26a
10
18
16
26
60
54
16
52
D
50
60
48
52
42
46
54
20
24

FIG. 6C

PANEL MOUNTED CONNECTOR ASSEMBLY

FIELD OF THE INVENTION

This invention generally relates to the art of connector assemblies, such as electrical connectors, fiber optic connectors and the like. More particularly, the invention relates to a latch-release system for allowing a connector to float or have limited movement relative to a mounting chassis, such as a panel, framework, backplane and the like.

BACKGROUND OF THE INVENTION

Electrical and other connector assemblies are used in a wide variety of applications wherein a connector is mounted through an aperture in a chassis such as a panel or the like. It often is desirable to mount the connector so that it has some degree of limited movement or "float" relative to the chassis or panel. For instance, in an automotive application, the chassis or panel and its mounted connector must be assembled in relation to another frame component or a printed circuit board, backplane or the like. By providing some degree of floating movement for the connector, accommodation is made for manufacturing tolerances when the entire system is assembled.

On the other hand, if a connector is mounted in a panel with floating movement relative thereto, it often is difficult to mate a complementary connector with the panel-mounted connector because the panel-mounted connector shifts around due to its floating movement. The present invention is directed to solving this problem by providing a unique latch-release system wherein a panel-mounted connector is latched against any floating movement relative to the panel to allow easy mating of a second connector, and the board-mounted connector is released after mating to allow limited floating movement of the connector relative to the panel.

SUMMARY OF THE INVENTION

An object, therefore, of the invention is to provide a new and improved connector assembly of the character described for mounting through an aperture in a panel, whereby the aperture defines an axis such as a mating axis.

In the exemplary embodiment of the invention, the assembly includes a mounting bracket or adapter mountable in the aperture in the panel. A first connector is insertable axially into the adapter and has limited axial floating movement relative to the adapter. A second connector is mateable axially with the first connector with a given mating force. The invention contemplates the provision of complementarily interengaging latch-release means between the first connector and the adapter to latch the first connector against the axial floating movement and to allow the second connector to be mated with the first connector with the given mating force. The latch-release means is released in response to a force greater than the given mating force to allow limited axial floating movement between the first connector and the adapter and, thereby, between the mated connectors and the panel.

As disclosed herein, the first and second connectors have complementarily interengaging male and female terminals which substantially define the given mating force between the connectors. The complementarily interengaging latch means comprise interengaging detent surfaces on the first connector and on the adapter. At least one of the detent surfaces is at an angle to define a release force greater than the given mating force. Specifically, the latch-release means comprise a triangulated detent boss on one of the first

connector and the adapter movable between a pair of opposed detent surfaces on the other of the first connector and the adapter.

According to another aspect of the invention, complementarily interengaging reset means are provided between the first connector and the adapter to cause the latch-release means to relatch in response to a reset force less than an unmating force being applied to the second connector in an unmating direction. As disclosed herein, the reset means comprise interengaging detent surfaces on the first connector and on the adapter. At least one of the detent surfaces is at an angle to define a reset force less than the unmating force. In the preferred embodiment, the triangulated detent boss which defines a portion of the latch-release means is shaped in the form of a diamond to provide both the angled detent surfaces of the latch-release means as well as the angled detent surfaces of the reset means.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIG. **1** is a perspective view of the panel mounted connector inserted through a receptacle in the panel mounting adapter;

FIG. **2** is a perspective view looking toward the back side of the assembly of FIG. **1**;

FIG. **3** is a view similar to that of FIG. **1**, with the mating connector mated to the panel mounted connector;

FIG. **4** is a horizontal section taken generally along line **4—4** of FIG. **3**;

FIG. **5** is a fragmented vertical section showing two pairs of mating terminals of the mated connectors; and

FIGS. **6**A–**6**C are sequential views of mating the connectors and releasing the panel mounted connector.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in greater detail, and first to FIGS. **1** and **2**, the invention is embodied in an electrical connector assembly, generally designated **10**, for mounting through an aperture in a panel (not shown). The assembly includes a mounting bracket or adapter, generally designated **14**, and a first or panel mounted connector, generally designated **16**. A second or mating connector, generally designated **18** (FIG. **3**), is mateable with the first or panel mounted connector **16** in the direction of arrow "A".

Adapter **14** includes a central body **20** defining a through receptacle **22** into which connector **16** is inserted in the direction of arrow "B" (FIG. **2**). A peripheral flange **24** projects radially outwardly around central body **20**. A flexible cantilevered arm **26** is provided on each of three sides of central body **20** to allow the adapter to be mounted in a cutout-type aperture in the panel such as at an edge of the panel. An abutment flange **26***a* projects radially outwardly from each cantilevered arm **26**. When the bracket is mounted in the cutout in the panel, central body **20** of the bracket is disposed in the cutout or aperture, and the panel is sand-

wiched between abutment flanges **26***a* and peripheral flange **24** of the bracket. Flexible arms **26** provide relative floating action between the bracket and the panel in the "X" and "Y" directions (i.e., parallel to the panel). A locking hole **28** (FIG. **2**) is provided in each side wall of central body **20** of the bracket for receiving a locking member **30** from connector **16**, as will be seen in greater detail hereinafter. The entire bracket **14**, including peripheral flange **24** and, flexible cantilevered arms **26**, is a one-piece structure which can be molded of dielectric material such as plastic or the like.

Referring to FIGS. **3** and **4** in conjunction with FIGS. **1** and **2**, mating connector **18** is a two-part structure for assembly purposes, including a terminal-mounting part **32** and a mating part **34**. The two parts are snapped together by a pair of latch arms **36** on terminal mounting part **32** which engage behind shoulders **38** on mating part **34**. The mating part has an outwardly flared mouth **40** to facilitate mating connector **18** with panel mounted connector **16**. Terminal mounting part **32** mounts a plurality of generally U-shaped terminals, generally designated **42**, which have cross portions **42***a* for connection to appropriate circuit traces on a circuit board (not shown). Each of the two parts **32** and **34** of mating connector **18** is a one-piece structure molded of dielectric material such as plastic or the like.

FIG. **4** best shows one of the locking holes **28** in the side wall of central body **20** of adapter **14** and the associated locking member **30** on connector **16**. It can be seen that locking members **30** have angled outer surfaces so that the locking members can snap into locking holes **28** in the bracket when the connector is inserted into the bracket in the direction of arrow "B". It also can be seen that locking holes **28** are larger than locking members **30**, and this defines the degree of limited floating movement of connector **16** relative to adapter **14**. This floating movement is in a "Z" direction as indicated by the double-headed arrow in FIG. **4**. In other words, while flexible cantilevered arms **26** allow bracket **14** and connector **16** to float generally parallel to the panel in the "X" and "Y" directions (FIG. **2**), connector **16** is capable of floating relative to bracket **14** in the "Z" direction generally perpendicular to the panel.

FIG. **5** shows a pair of the terminals **42** of mating connector **18** mated with a pair of terminals **44** of connector **16**. Each U-shaped terminal **42** has a terminal pin **42***b* which is inserted into a respective female terminal **44** of connector **16** by a positive or interference fit. Terminals **44** are terminated to electrical wires **45**. It can be understood that the mating force between the two connectors **16** and **18** comprises a composite force equal to the forces required for mating all of the terminal pins **42***b* and **44** of the two connectors and any forces generated by connector **16** slightly contacting connector **18**. This mating force can be easily calculated and would provide a "given mating force" of the connector assembly. In fact, some terminal manufacturers provide specifications on the mating forces required for specific mating terminals.

Referring to FIG. **6**A in conjunction with FIG. **1**, generally, connector assembly **10** is provided with a complementarily interengaging latch means, generally designated **46**, between the first or panel mounted connector **16** and adapter **14** to latch the first connector against the above-described axial floating movement in the "Z" direction and to allow mating connector **18** to be mated with the first connector with the given mating force without the floating action. Once the two connectors are mated, latch-release means **46** can be released in response to a force greater than the given mating force to allow limited axial floating movement of the two mated connectors relative to the adapter and the panel. This arrangement also allows the connector **16** to mate in multiple cycles with mating connectors having varying tolerance ranges.

More particularly, latch-release means **46** includes a triangulated detent boss **48** defining a pair of inwardly facing angled detent surfaces **50**. One of the bosses is molded integrally with and projects from both the top and the bottom of first connector **16**. The detent boss moves between a pair of detent surfaces **52** at the inner distal ends of a pair of latch-release arms **54** molded integrally with adapter **14**. It can be understood that with a given flexing force built into arms **54**, the amount of force required for pushing detent boss **48** past detent surfaces **52** is determined by the angles of detent surfaces **50** on the detent boss. According to the invention, the angles of detent surfaces **50** are such that it requires a greater force to move detent boss **48** past detent surfaces **52** of arms **54** than the given mating force of the two connectors. Therefore, the two connectors are mated before panel mounted connector **16** is capable of floating relative to adapter **14** and the panel.

The above intended scenario is shown by comparing FIGS. **6**A–**6**C. FIG. **6**A shows mating connector **18** about to be mated with panel mounted connector **16** in the direction of arrow "C". At this point, connector **16** does not float in the "Z" direction (FIG. **4**) because locking members **30** are engaged at the front of locking holes **28** so that connector **16** cannot move forwardly, and the connector cannot move rearwardly because of the engagement of boss **48** (FIG. **6**A) with detent surfaces **52** of arms **54**.

FIG. **6**B shows mating connector **18** having been fully mated with panel mounted connector **16**. The panel mounted connector still cannot float because triangulated boss **48** of latch-release means **46** still has not moved past detent surfaces **52** of arms **54**. As stated above, this required force is greater than the mating forces between the two connectors.

FIG. **6**C shows mating connector **18** having been moved further toward board-mounted connector **16** in the direction of arrow "D". In other words, a force greater than the mating force has now been applied to mating connector **18** to drive triangulated boss **48** of connector **16** past detent surfaces **52** of arms **54** on adapter **14**. The two mated connectors now can float in the "Z" direction relative to the adapter and relative to the panel within the limits defined by locking members **30** (FIG. **4**) of the board mounted connector within the enlarged locking holes **28** of the adapter.

The invention also contemplates that a reset means be provided between panel mounted connector **16** and adapter **14** to cause the latch-release means **46** to relatch or reset in response to a reset force less than an unmating force being applied to mating connector **18** in an unmating direction (i.e., opposite the directions of arrow "C" (FIG. **6**B). The reset means simply is provided by configuring boss **48** in the shape of a diamond to define a pair of detent surfaces **60** facing in an unmating direction, i.e., opposite the direction of detent surfaces **50**. It also can be clearly seen in FIGS. **1** and **6**A–**6**C that detent surfaces **60** are at a lesser angle than that of detent surfaces **50** in the mating/unmating direction. With the lesser angles for detent surfaces **60**, boss **48** can be pulled back outwardly past the detent surfaces of arms **54** with a lesser force which can be determined to be less than the unmating (mating) force.

Therefore, when an unmating force is applied to mating connector **18** in a direction opposite arrow "D" in FIG. **6**C, boss **48** will move back outwardly of detent surfaces **52** on arms **54** to the position shown in FIG. **6**B without unmating

connector **18**. The connector then can be completely unmated as shown in FIG. **6**A, and connector **16** can no longer float in the "Z" direction, whereby the assembly is now ready for another mating cycle.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

What is claimed:

1. A connector assembly for mounting through an aperture in a panel, the aperture defining an axis, comprising:

an adapter mountable in the aperture in the panel;

a first connector insertable axially into the adapter and having limited axial floating movement relative to the adapter;

a second connector mateable axially with the first connector with a given mating force,

wherein said first and second connectors have complementary interengaging male and female terminals which substantially define said given mating force between the connectors; and

complementary interengaging latch-release means between the first connector and the adapter to latch the first connector against said axial floating movement and to allow the second connector to be mated with the first connector with said given mating force and to release the latch-release means in response to a force greater than said given mating force to allow said limited axial floating movements

wherein said complementary interengaging latch-release means comprise interengaging detent surfaces on the first connector and on the adapter, at least one of the detent surfaces being at an angle to define a release force greater than said given mating force.

2. The connector assembly of claim **1** wherein said complementary interengaging latch-release means comprise a triangulated detent boss on one of the first connector and the adapter movable between a pair of opposing detent surfaces on the other of the first connector and the adapter.

3. The connector assembly of claim **1**, including complementarily interengaging reset means between the first connector and the adapter to cause the latch-release means to relatch in response to a reset force less than an unmating force being applied to the second connector in an unmating direction.

4. The connector assembly of claim **3** wherein said complementarily interengaging reset means comprise interengaging detent surfaces on the first connector and on the adapter, at least one of the detent surfaces being at an angle to define a reset force less than said unmating force.

5. The connector assembly of claim **4** wherein said complementarily interengaging reset means comprise a triangulated detent boss on one of the first connector and the adapter movable between a pair of opposing detent surfaces on the other of the first connector and the adapter.

6. A connector assembly for mounting through an aperture in a panel, the aperture defining an axis, comprising:

an adapter mountable in the aperture in the panel;

a first connector insertable axially into the adapter and having limited axial floating movement relative to the adapter;

a second connector mateable axially with the first connector with given mating and unmating forces;

complementary interengaging latch-release means between the first connector and the adapter to latch the first connector against said axial floating movement and to allow the second connector to be mated with the first connector with said given mating force and to release the latch-release means in response to a force greater than said given mating force to allow said limited axial floating movement;

complementarily interengaging reset means between the first connector and the adapter to cause the latch-release means to relatch in response to a reset force less than an unmating force being applied to the second connector in an unmating direction; and

said complementary interengaging latch-release means including first interengaging angled detent surfaces on the first connector and on the adapter, said complementary interengaging reset means including second angled detent surfaces on the first connector and on the adapter, the first detent surfaces being at an angle to define a release force greater than said given mating force and the second detent surfaces being at an angle to define a reset force less than said given unmating force.

7. The connector assembly of claim **6** wherein said first and second connectors have complementarily interengaging male and female terminals which substantially define said given mating and unmating forces between the connectors.

8. The connector assembly of claim **6** wherein said first and second angled detent surfaces include opposing detent surfaces on opposite sides of a diamond-shaped detent boss on one of the first connector and the adapter.

9. A connector assembly for mounting through an aperture in a chassis, comprising:

a bracket mountable in the aperture at the chassis;

a first connector mountable to the bracket and having limited floating movement relative thereto;

a second connector mateable with the first connector with a given mating force, wherein said first and second connectors have complementary interengaging male and female terminals which substantially define said given mating force between the connectors; and

complementary interengaging latch-release means between the first connector and the bracket to latch the first connector against said floating movement and to allow the second connector to be mated with the first connector with said given mating force and to release the latch-release means in response to a force greater than said given mating force to allow said limited floating movement,

wherein said complementary interengaging latch-release means comprise interengaging detent surfaces on the first connector and on the bracket, at least one of the detent surfaces being at an angle to define a release force greater than said given mating force.

10. The connector assembly of claim **11** wherein said complementarily interengaging latch-release means comprise a triangulated detent boss on one of the first connector and the bracket movable between a pair of opposing detent surfaces on the other of the first connector and the bracket.

11. The connector assembly of claim **9**, including complementarily interengaging reset means between the first connector and the bracket to cause the latch-release means to relatch in response to a reset force less than an unmating force being applied to the second connector in an unmating direction.

12. The connector assembly of claim **11** wherein said complementarily interengaging reset means comprise

interengaging detent surfaces on the first connector and on the bracket, at least one of the detent surfaces being at an angle to define a reset force less than said unmating force.

13. The connector assembly of claim **12** wherein said complementarily interengaging reset means comprise a triangulated detent boss on one of the first connector and the bracket movable between a pair of opposing detent surfaces on the other of the first connector and the bracket.

* * * * *